## Surveys of Significant Plant Resources and Related Vegetation Types for the Butte Office of the Bureau of Land Management

Prepared for:

Bureau of Land Management Butte Field Office

By:

Scott Mincemoyer

Montana Natural Heritage Program Natural Resource Information System Montana State Library

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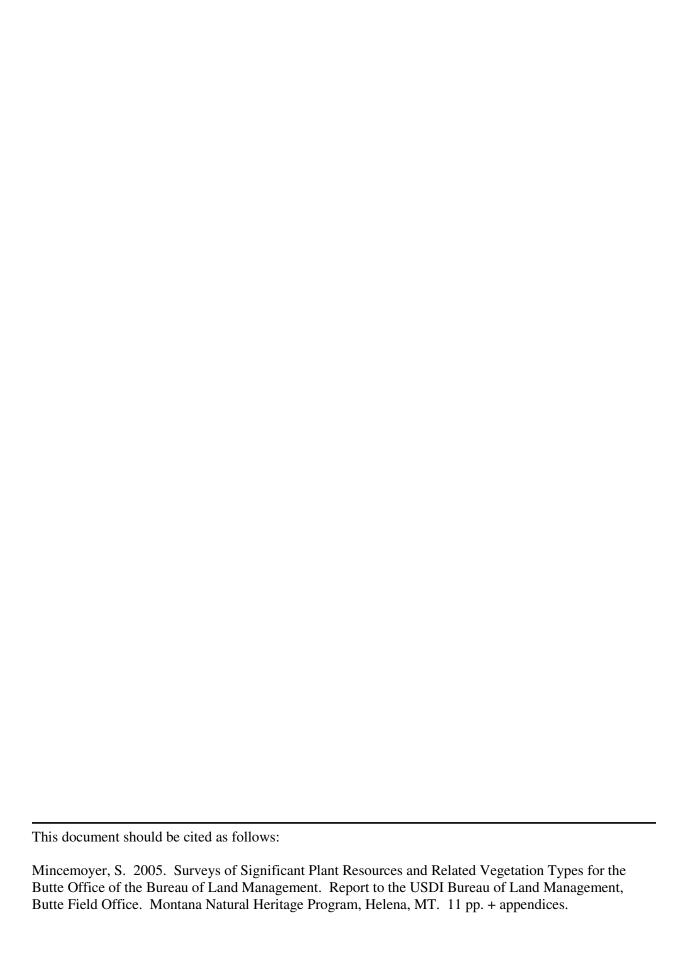
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#### **EXECUTIVE SUMMARY**

Lands administered by the Bureau of Land Management (BLM) cover vast and diverse areas of Montana. As such, BLM lands provide significant habitat to many species of conservation concern within the state. The Butte Field Office is no different and accordingly harbors significant populations of several vascular plant Species of Concern (SOC). Lands managed by the Butte Field Office are scattered across areas of southwestern and central Montana. BLM lands in this area are generally small, isolated parcels, though several large, contiguous blocks of BLM land do occur. Total acres managed by the Butte Field Office are approximately 287,000 acres.

The purpose of this report is to document the results of recent surveys for Species of Concern on Butte Field Office lands along with available information on these species' biology, ecology, habitat requirements, etc. Field surveys were conducted by Heritage Program Botany and Ecology staff in 2003-2005. Additionally, data pertaining to all occurrences of known Plant Species of Concern on Field Office administered lands are presented.

Plant Species of Concern in Montana include all S1 and S2 taxa along with G3 (Globally vulnerable) taxa. Many of these species are also ranked as "Sensitive" on BLM lands in the state (Bureau of Land Management 2005). See

Appendix A for a full description of global and state rank definitions.

The field surveys conducted during this project help to provide a clearer picture of the abundance and distribution of these species not only on Butte Field Office lands but across the region. Positive survey results as well as negative (not finding a species in a particular location) survey results both provide valuable information that will be useful for conservation planning and management across BLM lands and other ownerships in the state.

Field surveys conducted as part of this study in 2003-2005 documented four new occurrences of Plant Species of Concern, one Astragalus convallarius, two Brickellia oblongifolia and one Physaria saximontana var. dentata occurrence. The discovery of the Brickellia oblongifolia occurrence along Soap Gulch is only the third known extant location in the state, all three occurring on the Butte Field Office. In addition to the discovery of new occurrences, several other SOC occurrences that were revisited resulted in the expansion of the population, discovery of new subpopulations nearby, current population counts/estimates or in the refinement of mapped population boundaries. In total, 33 occurrences of ten vascular Plant Species of Concern are known on the Butte Field Office.

#### **ACKNOWLEDGEMENTS**

Data collected in the course of field surveys by Curtis Bjork and Steve Cooper provided the basis for much of the new survey data in this report. Other data collected by numerous individuals, most notably Bonnie Heidel, Peter Lesica and Jim Vanderhorst provide the basis for many of the known occurrences of Species of Concern in this report. Floyd Thompson at the Butte Field Office was instrumental in implementing many aspects of this project and also provided several new occurrences of *Astragalus convallarius* in the Helena area. As always, thanks to Kathy Lloyd and Coburn Currier for editing and final printing, though any omissions or errors are of my own doing.

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#### INTRODUCTION

Lands administered by the Bureau of Land Management (BLM) cover vast and diverse areas of Montana. As such, BLM lands provide significant habitat to many species of conservation concern within the state. The Butte Field Office is no different and accordingly harbors significant populations of several vascular plant Species of Concern.

Plant Species of Concern in Montana include all S1 and S2 taxa along with G3 (globally vulnerable) taxa. Many of these species are also ranked as "Sensitive" on BLM lands in the state (Bureau of Land Management 2005). See Appendix A for a full description of global and state rank definitions.

Several surveys and reports documenting vascular plants on BLM administered lands within the Butte Field Office over the years are available. These surveys and reports include the Limestone Hills area (Heidel 1994; Scow and Culwell 1993; and Scow and Beaver 1999), the Scrtachgravel Hills (Heidel and Cooper 1998), the Doherty Mountain area (Vanderhorst 1994), the Humbug Spires (Lowry II 1919) and a report on threatened, endangered, rare, or sensitive plants of the Headwaters Resource Area on the Butte District of the BLM (Horn 1980).

The purpose of this report is to document the results of recent surveys for Species of Concern on Butte Field Office lands and provide available information on these species' biology, ecology, habitat requirements, etc. Additionally, data pertaining to all known occurrences of plant Species of Concern on Buute Field Office administered lands are presented. However, a great deal of information pertaining to the ecology, distribution, abundance and management of several of these taxa is still lacking and the collection of much of that information is beyond the scope of this provincial project.

The field surveys conducted during this project help to provide a clearer picture of the abundance and distribution of these species not only on Butte Field Office lands but across the region. Positive survey results as well as negative survey (not finding a species in a particular location) results provide valuable information that will be useful for conservation planning and management decisions across BLM lands and other ownerships in the state.

#### **Study Area**

Lands managed by the Butte Field Office of the Bureau of Land Management (BLM) cover a large and diverse area of southwestern and central Montana. BLM lands in this area are generally scattered and intermixed with other ownerships, and include many small, isolated parcels, though several large, contiguous blocks of BLM land do occur. Surface acres managed by the Butte Field Office were listed at 287,067 acres in 2003. The majority of these lands occur in an area between Melrose in the southwest, Three Forks in the southeast and Wolf Creek in the north. Counties include Broadwater, Deerlodge, Gallatin, Jefferson, Lewis and Clark, Park and Silver Bow.

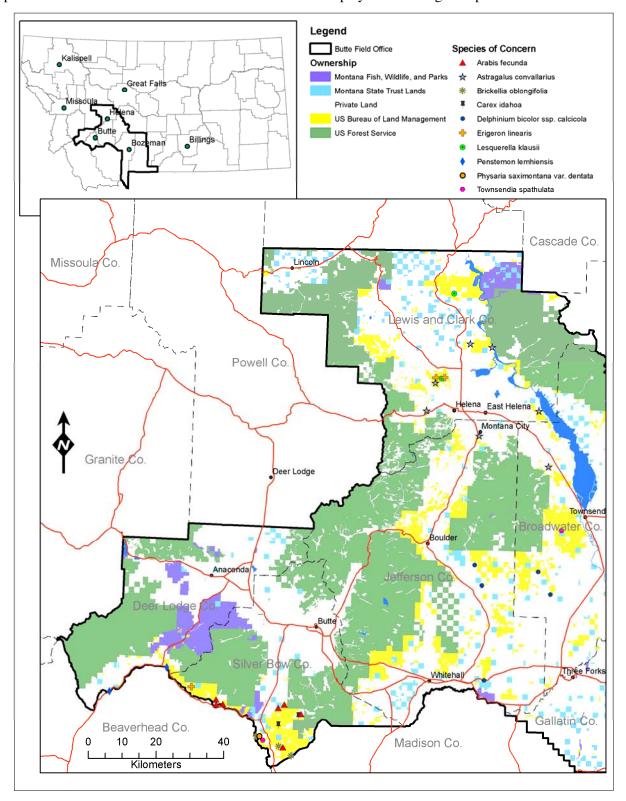
The topography is varied across the study area though the majority of BLM lands in the area occupy the valleys and the lower slopes of several mountain ranges, as is common with BLM managed lands elsewhere. Mountainous terrain dominates the landscape. The Big Belts, Boulder, Butte Highlands and Elkhorn ranges are the prevalent high mountains in the areas where BLM lands are concentrated. Other minor named ranges, though less prominent, contain some of the most ecologically significant areas in the Butte Field Office, including the Humbug Spires south of

Butte, the Limestone Hills near Townsend and the Scratchgravel Hills just west of Helena.

Dominant vegetation in the area is sagebrush steppe and wheatgrass-fescue grasslands at low to mid elevations. Ponderosa pine and Douglas-fir dominate forested areas at mid elevations and on cooler slopes. The highest elevations support lodgepole pine, spruce-fir and alpine communities.

The study area, being almost entirely east of the Continental Divide, is primarily influenced by a continental climate regime. The weather patterns in the area are typical of many other semi-arid, mountainous regions. Temperatures are highest and precipitation lowest in the valleys, with precipitation increasing significantly at higher elevations with a corresponding decrease in temperature. In Helena, the average maximum daily temperature in July is 82.7°F and the average January minimum is 11.2°F. Annual precipitation in Helena averages 11.9 inches (Western Regional Climate Center 2005). In comparison, the crests of the higher mountain ranges, such as the Elkhorn Mountains, Boulder Mountains and Butte Highlands receive three to four times as much precipitation, with much of it falling as snow.

Figure 1. Butte BLM Field Office lands with locations of Montana Natural Heritage Program Species of Concern. Only populations wholly or partially occurring on BLM lands are displayed and only the portion of the Field Office with known occurrences is displayed in the larger map.



#### **METHODS**

Before the start of the 2003 field season, target vascular plant species and potential sample areas were identified for survey. The primary list of target species and sample areas was identified by Peter Lesica, consulting botanist in Missoula, with additional input by Montana Natural Heritage Program (MTNHP) staff as well as Bureau of Land Management staff. These target species are provided in Table 1 and sample areas are provided in Table 2. Field surveys were conducted by Heritage Program Botany and Ecology staff in 2003-2005.

Surveys were concentrated in areas listed in Table 2, though several other areas were also surveyed. In addition to the fieldwork component, visits to the University of Montana Herbarium (MONTU) were conducted to document existing occurrences for the Field Office and to collect specimen locations for many of the target species. Existing element occurrences in the MTNHP database were also checked for accuracy of locational data and spatial representation. This step was important due to a previous upgrade in database software that

allows for digitally mapping polygonal features in contrast to the old software which only allowed for tracking occurrences as individual points.

Specimen collections housed at MONTU and information (e.g. floras, field survey records) housed at MTNHP were also searched for occurrences of Species of Concern on Butte Field Office lands that were never added to the MTNHP database. All survey data collected during this project were entered into MTNHP databases.

Conditions in 2003 were dry and thus not optimal for conducting some of the surveys. Drought conditions during that year undoubtedly made it more difficult to detect plant populations because growth and flowering were reduced for many species. Both 2004 and 2005 were good precipitation years. Field surveys in 2003 were conducted by Curtis Bjork, 2004 surveys by Scott Mincemoyer and additional surveys in 2005 by Steve Cooper.

Table 1. List of Species of Concern originally targeted for survey.

Scientific Name	Common Name	Heritage Rank
Adoxa moschatellina	Musk-root	G5/S2
Allium parvum	Small onion	G5/S2
Arabis fecunda	Sapphire rockcress	G2/S2
Astragalus convallarius	Lesser rushy milkvetch	G5/S2
Carex idahoa	Idaho sedge	G2/S2
Castilleja gracillima	Slender Indian paintbrush	G3G4Q/S2
Erigeron asperugineus	Idaho fleabane	G4/S1
Erigeron parryi	Parry's fleabane	G2/S2
Eriogonum soliceps	Railroad canyon buckwheat	G2/S2
Gentianopsis simplex	Hiker's gentian	G5/S1
Lesquerella paysonii	Payson bladderpod	G3/S1
Lesquerella pulchella	Beautiful bladderpod	G2/S2
Phacelia scopulina	Dwarf phacelia	G4/SH

Table 2. Target sample areas identified prior to fieldwork.

County	Sample Area	Potential Species/Description
Broadwater	Johnny Gulch	Adoxa moschatellina and Astragalus convallarius
	Doherty Mtn.	Limestone derived soils
Jefferson	Horse Gulch – Hunting Gulch	Adoxa moschatellina and Astragalus convallarius
Jenerson	Sheep Rock – St. Paul Gulch (Golden Sunlight Mine area)	Unusual soil contact zones
	Beartooth Mtn (Sleeping Giant)	Astragalus convallarius
Larria 6- Clark	Hauser Dam area	Astragalus convallarius
Lewis & Clark	Mahogany Cove – Crittendon Gulch	Astragalus convallarius
	Trout Creek area	Astragalus convallarius
	Moffett Mtn. – Old Glory Mtn.	Arabis fecunda, Lesquerella pulchella and Phacelia scopulina; primarily in soils derived from limestone.
Silver Bow	Moose Creek Wetlands (Humbug Spires)	Wetland species; e.g. Carex idahoa, Castilleja gracillima and Gentianopsis simplex
	North end Humbug Spires	Arabis fecunda

#### RESULTS

Field surveys conducted as part of this study in 2003-2005 documented four new occurrences of plant Species of Concern (SOC), one Astragalus convallarius, two Brickellia oblongifolia and one Physaria saximontana var. dentata occurrence (Table 4). The discovery of the Brickellia oblongifolia occurrence along Soap Gulch represents only the third known extant location in the state, all three occurring on Butte Field Office land near Melrose. In addition to the discovery of new occurrences, several other SOC occurrences that were revisited resulted in the expansion of the population, discovery of new subpopulations nearby, provided current population counts/estimates or refinement of mapped population boundaries. See Appendix D for mapped locations of all known occurrences of Species of Concern on lands managed by the Butte Field Office.

Several of the target areas identified for survey prior to the start of fieldwork were visited in more than one year (Table 3). However, several areas were only visited once, and for a few of the areas visited in 2003, exact survey dates and locations are uncertain. In addition to the identified target areas, a few other areas were also quickly surveyed (e.g. Kimber Gulch).

Perhaps the most important additions to SOC information and locational data that were added to the MNTHP database during the course of this study are for several globally rare "G3" taxa endemic to Montana that have not been tracked in recent years (see Appendix A for Global/State Ranks). These globally rare, G3 taxa went untracked in recent years for several reasons, perhaps the primary reason being that only S1 and S2 ranked plant taxa were previously considered Species of Concern by MTNHP. Additionally, limited financial and personnel resources, as well as limited computer resources, resulted in G3 ranked taxa not being consistently tracked or information updated. Recently, increased attention to globally rare taxa (G1-G3) by federal agencies involved in conservation makes it vital for

MTNHP to include and update information on these species. This effort resulted in eight total occurrences for *Delphinium bicolor* ssp. *calcicola*, *Lesquerella klausii* and *Physaria saximontana* var. *dentata* on the Butte Field Office being added to MTNHP databases in the last half of 2005. Addition of the remaining known occurrences and data to MTNHP databases outside of the Butte Field Office for these Montana endemic taxa will occur in the near future.

The only Montana Natural Heritage Program state rank that has changed during the course of this project is the rank for *Brickellia oblongifolia*. The preliminary state rank for the species after the end of the 2003 field season was S2. After conducting further surveys, the apparent rarity of the species in Montana justifies a change in the state rank to an S1.

In the Doherty Mountain area, Cercocarpus ledifolius (curlleaf mountain mahogany) is abundant on limestone and limestone-derived soils on upper slopes that have a large component of exposed rock and gravel. These extensive communities of curlleaf mountain mahogany are significant because they are some of the most northern occurrences of this vegetation type. Though the species occurs slightly further to the north, the communities in the Doherty Mountain area are worth noting for their extent and adundance near the species' northern limit. Additionally, data were collected on three vegetation communities in the area; these are Pinus flexilis/Cercocarpus ledifolius (limber pine/curlleaf mtn mahogany), Cercocarpus ledifolius/ Pseudoroegneria spicata (curleaf mountain mahogany/bluebunch wheatgrass), and Pascopyrum smithii-Nasella viridula (western wheatgrass-green needlegrass). Though these commuities are not rare in the state they represent, particularly in the case of the western wheatgrass green needlegrass community, examples of each vegetation type on BLM land that are in "good" condition.

Table 3. Areas of BLM land surveyed during this study with major findings.

Table 3. Areas of BLM land surveyed during this study with major findings.  BLM Sections				
Survey Sites	Survey Date	Surveyed	Results	
Beartooth Mtn. (Sleeping Giant)	June 23, 2004	T13N R3W sec 8	No new occurrences	
Brown's Gulch (eastside Hauser Lake)	June 26, 2004	T11N, R1W, sec 32, T10N R1W sec 6	No new occurrences	
Camp Creek	July 1, 2004	Length of drainage	2 new subpops for Brickellia oblongifolia	
Mahogany Cove - Crittenden Gulch (Spokane Hills)	June 16, 2004	T10N, R1W, sec 26, 27	New subpops of Astragalus convallarius	
Doherty Mountain	June 22, 2004 and July 5 & 12, 2005	T2N, R2W, sec 30, 31	No new occurrences	
Golden Sunlight Mine	June 21 & 22, 2004	T2N, R3W, sec 17 T2N, R4W, sec 13, 18, 24	No new occurrences	
Hauser Dam	June 9, 2004	T12N R2W sec 29, 30	New occurrence of Astragalus convallarius	
Horse Gulch – Dry Creek (south end of Elkhorns)	June 21, 2004	T5N, R2W sec 6 T5N, R3W, sec 12, 14	No new occurrences	
Humbug Spires – north end	July 9, 2004 and July 8, 2005	T1N, R8W, sec 31 T1S, R9W, sec 1	Revisited and better defined 2 occurrences of <i>Arabis fecunda</i>	
Indian Creek (Limestone Hills)	July 2003 and June 17, 2004	T7N, R1E, sec 25, 36 T6N, R1W, sec 1 T6N, R1E, sec 5, 6 T7NR1E, sec 28, 31, 32	No new occurrences	
Johnny Gulch (southeast end of Elkhorns)	July 2003	N.A.	No new occurrences	
Old Glory Mountain	July 10, 2003	N.A.	No new occurrences	
Moose Creek – MacLean Creek (Humbug Spires)	July 2003; July 7 & 8, 2004 and July 2005	T1S, R9W, sec 12, 13, 23, 24, 27 T1S, R8W, sec 7, 10, 18	No new occurrences, revisited 1 <i>Arabis</i> fecunda	
Maiden Rock – Goat Mtn.	July 10, 2003	T1S, R9W, sec 32, 33	New occurrence of Brickellia oblongifolia and Physaria saximontana var. dentata	
Pipestone area	June 2004	N.A.	No new occurrences	
Soap Gulch	July 10, 2003; June 30, July 1 & 8, 2004	Length of drainage	1 new occurrence of Brickellia oblongifolia	
Trout Creek (eastside of Hauser Lake)	June 26, 2005	T11N R2W sec 18 (north half)	No new occurrences	
Wise River	July 7, 2005	T1N, R10W sec 31, 32 T1S, R10W, sec 5	Revisit of 2 <i>Arabis fecunda</i> occurrences	
Winston – Kimber Gulch	June 17, 2004	T8N, R1E, sec 28, 29, 30	1 new subpop of Astragalus convallarius	

Table 4. Documented occurrences of MTNHP Species of Concern (including G3 taxa) on Butte BLM Field Office lands. Populations discovered/surveyed as part of this study are listed in "bold."

Taxa	BLM Status	Heritage Rank	EO #	EO Rank	Date of First Survey	Date of Last Survey
			7	В	June 7, 1988	July 7, 2005
			10	В	June 7, 1988	June 5, 1990
4 1 0 1			16	A	June 27, 1992	July 8, 2005
Arabis fecunda	Sensitive	G2/S2	17	A	June 27, 1992	July 9, 2004
Sapphire rockcress			18	A	June 26, 1992	July 8, 2005
			21	В	June 11, 2002	June 11, 2002
			22	В	July 3, 1994	July 3, 1994
			42	В	1986	June 17, 2004
			82	В	June 11, 1980	June 16, 2004
A -41			9	A	June 20, 1997	May 26, 2004
Astragalus convallarius			13	CD	July 2, 2004	July 2, 2004
Lesser rushy	Sensitive	G5/S2	14	CD	July 7, 2004	July 7, 2004
milkvetch			15	С	Sept 26, 2002	Sept 26, 2002
IIIIKVELCII			16 <sup>1</sup>	BC	June 9, 2004	June 9, 2004
			Limestone Hills <sup>3</sup>	U	N.A.	N.A.
Brickellia			11	В	July 10, 2003	July 10, 2003
oblongifolia		G5/S1	21	CD	July 8, 2004	July 8, 2004
Mohave brickellbush			32	BC	June 20, 2003	July 1, 2004
Carex idahoa Idaho sedge	Sensitive	G2/S2	15	U	June 11, 1979	Failed to relocate in 2005
			1	В	May 28, 1994	May 28, 1994
Delphinium bicolor		G4G5T3/	2	U	May 28, 1994	May 28, 1994
ssp. calcicola		S3	3	U	May 30, 1994	May 30, 1994
Limestone larkspur		33	4	В	May 30, 1994	May 30, 1994
			5	В	June 5, 1993	June 5, 1993
Evicenon lineavis			4	В	June 21, 1997	June 9, 1998
Erigeron linearis Linear-leaf fleabane	Sensitive	G5/S1	6	В	June 27, 1999	June 27, 1999
Linear-lear meabane			9	В	June 24, 1997	June 24, 1997
Lesquerella klausii		G3/S3	23	С	Sept 13, 1987	Sept 13, 1987
Divide bladderpod		03/33	35	В	July 22, 1997	June 9, 1998
Penstemon			49	A	July 28, 1993	August 1996
<i>lemhiensis</i> Lemhi beardtongue	Sensitive	G2/S2	57	D	July 7, 1993	July 7, 1993
Physaria saximontana var. dentata Rocky Mtn twinpod		G3T3/S3	01	U	2003	2003
Townsendia			6	В	May 21, 1985	May 19, 1993
spathulata Sword townsendia		G3/S3	10	U	June 12, 2002	June 12, 2002

<sup>&</sup>lt;sup>1</sup> New population discovered as part of this study. <sup>2</sup> Mapped new subpopulations/expanded occurrence. <sup>3</sup> Unmapped occurrence based on reported presence of the species in the area by Scow and Beaver 1999.

## DISCUSSION AND RECOMMENDATIONS

Future surveys on Butte Field Office lands are likely to find additional occurrences of several vascular plant Species of Concern. Occurrences of Erigeron parryi are known from sections adjacent to BLM lands near Doherty Mountain and near the south end of the Elkhorns. However, surveys during this study failed to find any occurrences on BLM lands, with specimens collected in the area being identified as the similar Erigeron ochroleucus. Additional surveys may eventually find E. parryi on BLM land in the vicinity. In the Limestone Hills, Polygonum douglasii var. austinae has previously been reported (Scow and Beaver 1999) and Delphinium bicolor ssp. calcicola is suspected (Heidel 1996), though neither were survey targets during this project. Habitat in the area is suitable for both species.

Phacelia scopulina is only known from one historical collection near Melrose. Attempts to relocate this species in the area have been unsuccessful, though future surveys may eventually relocate the species in the vicinity. Surveys in the Melrose area during this project were generally too late in the field season to readily detect this plant.

Surveys of the Moose Creek drainage in the Humbug Spires for several wetland/riparian species (e.g. *Carex idahoa*, *Castilleja gracillima* and *Gentinopsis simplex*) though unsuccessful do not preclude the existence of these or other Species of Concern in the area. *Carex idahoa* is known from further up the drainage and the riparian area is extensive along sections of Moose Creek in the Humbug Spires and the riparian areas are generally in good condition.

South of the Humbug Spires between Soap Gulch and Camp Creek, the potential for finding *Eriogonum soliceps* is still good. However, only specimens of the more common and very similar *E. mancum* were found in this area during field surveys.

Future plant surveys are also likely to find additional occurrences of several of the taxa already known to occur on Butte Field Office lands (Table 4). Specific recommendations for future surveys include the following: Beartooth Mountain (Sleeping Giant) and lands north for Astragalus covallarius, Lesquerella klausii and Erigeron linearis; surveys for the state endemic Delphinium bicolor ssp. calcicola in areas of limestone and limestone-derived soils; additional surveys in the Golden Sunlight Mine area for several taxa in soil contact zones; and additional surveys for Astragalus convallarius in areas of suitable grasslands.

Future revisions of the Montana/Dakotas BLM sensitive plant list should consider the addition of those species listed in Table 4 that are not already listed as "sensitive." Consideration of *Delphinium bicolor* ssp. *calcicola*, *Lesquerella klausii*, *Physaria saximontana* var. *dentata* and *Townsendia spathulata* for addition to the list is warranted due to the global rarity of each, and *Brickellia oblongifolia* may warrant addition to the list due to its rarity in the state; all three currently known extant occurrences of the species being on BLM lands.

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#### HERITAGE PROGRAM RANKS

The international network of Natural Heritage Programs employs a standardized ranking system to denote global (range-wide) and state status. Species are assigned numeric ranks ranging from 1 to 5, reflecting the relative degree to which they are "at-risk". Rank definitions are given below. A number of factors are considered in assigning ranks — the number, size and distribution of known "occurrences" or populations, population trends (if known), habitat sensitivity, and threat. Factors in a species' life history that make it especially vulnerable are also considered (e.g., dependence on a specific pollinator).

#### GLOBAL RANK DEFINITIONS (NatureServe 2003)

G1	Critically imperiled because of extreme rarity and/or other factors making it
	highly vulnerable to extinction
G2	Imperiled because of rarity and/or other factors making it vulnerable to extinction
G3	Vulnerable because of rarity or restricted range and/or other factors, even though
	it may be abundant at some of its locations
G4	Apparently secure, though it may be quite rare in parts of its range, especially at
	the periphery
G5	Demonstrably secure, though it may be quite rare in parts of its range, especially
	at the periphery
T1-5	Infraspecific Taxon (trinomial) — The status of infraspecific taxa (subspecies or
	varieties) are indicated by a "T-rank" following the species' global rank

#### STATE RANK DEFINITIONS

S1	At high risk because of extremely limited and potentially declining numbers,
	extent and/or habitat, making it highly vulnerable to extirpation in the state
S2	At risk because of very limited and potentially declining numbers, extent and/or
	habitat, making it vulnerable to extirpation in the state
S3	Potentially at risk because of limited and potentially declining numbers, extent
	and/or habitat, even though it may be abundant in some areas
S4	Uncommon but not rare (although it may be rare in parts of its range), and
	usually widespread. Apparently not vulnerable in most of its range, but possibly
	cause for long-term concern
S5	Common, widespread, and abundant (although it may be rare in parts of its
	range). Not vulnerable in most of its range

#### **COMBINATION RANKS**

G#G# or S#S# Range Rank—A numeric range rank (e.g., G2G3) used to indicate uncertainty about the exact status of a taxon

#### **QUALIFIERS**

NR Not ranked

Q Questionable taxonomy that may reduce conservation priority—
Distinctiveness of this entity as a taxon at the current level is questionable;
resolution of this uncertainty may result in change from a species to a subspecies
or hybrid, or inclusion of this taxon in another taxon, with the resulting taxon
having a lower-priority (numerically higher) conservation status rank

X **Presumed Extinct**—Species believed to be extinct throughout its range. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered Η **Possibly Extinct**—Species known from only historical occurrences, but may never-theless still be extant; further searching needed U Unrankable—Species currently unrankable due to lack of information or due to substantially conflicting information about status or trends HYB **Hybrid**—Entity not ranked because it represents an interspecific hybrid and not a species ? **Inexact Numeric Rank**—Denotes inexact numeric rank C Captive or Cultivated Only—Species at present is extant only in captivity or cultivation, or as a reintroduced population not yet established A Accidental—Species is accidental or casual in Montana, in other words, infrequent and outside usual range. Includes species (usually birds or butterflies) recorded once or only a few times at a location. A few of these species may have bred on the one or two occasions they were recorded Z **Zero Occurrences**—Species is present but lacking practical conservation concern in Montana because there are no definable occurrences, although the taxon is native and appears regularly in Montana P **Potential**—Potential that species occurs in Montana but no extant or historic occurrences are accepted R **Reported**—Species reported in Montana but without a basis for either accepting or rejecting the report, or the report not yet reviewed locally. Some of these are very recent discoveries for which the program has not yet received first-hand information; others are old, obscure reports **Synonym**—Species reported as occurring in Montana, but the Montana Natural **SYN** Heritage Program does not recognize the taxon; therefore the species is not assigned a rank A rank has been assigned and is under review. Contact the Montana Natural Heritage Program for assigned rank В **Breeding**—Rank refers to the breeding population of the species in Montana **Nonbreeding**—Rank refers to the non-breeding population of the species in N Montana

# APPENDIX B. ELEMENT OCCURRENCE RANK DEFINITIONS

#### ELEMENT OCCURRENCE RANK DEFINITIONS

- A Excellent estimated viability/ecological integrity
- A? Possibly excellent estimated viability/ecological integrity
- AB Excellent or good estimated viability/ecological integrity
- AC Excellent, good, or fair estimated viability/ecological integrity
- B Good estimated viability/ecological integrity
- B? Possibly good estimated viability/ecological integrity
- BC Good or fair estimated viability/ecological integrity
- BD Good, fair, or poor estimated viability/ecological integrity
- C Fair estimated viability/ecological integrity
- C? Possibly fair estimated viability/ecological integrity
- CD Fair or poor estimated viability/ecological integrity
- D Poor estimated viability/ecological integrity
- D? Possibly poor estimated viability/ecological integrity
- E Verified extant (viability/ecological integrity not assessed)
- F Failed to find
- F? Possibly failed to find
- H Historical
- H? Possibly historical
- X Extirpated
- X? Possibly extirpated
- U Unrankable
- NR Not ranked

# APPENDIX C. SPECIES ACCOUNTS FOR PLANT SPECIES OF CONCERN ON THE BUTTE FIELD OFFICE

### Arabis fecunda (Brassicaceae) Sapphire rockcress

BLM Status: Sensitive Heritage Ranking: G2/S2

RANK JUSTIFICATION: Sapphire rockcress is a state endemic known from several locations in three mountain ranges where it is restricted to specific and localized habitats. Encroachment of spotted knapweed threatens several populations that may be genetically distinct. It is unclear whether grazing has significant negative impacts.

**IDENTIFICATION:** *Arabis fecunda* is a small perennial with 1 to many clusters of basal leaves arising from a simple or branched rootcrown and



Arabis fecunda plant

1 to many, unbranched, flowering stems that are up to 30 cm high. The spoon-shaped or lance-shaped basal leaves are 10-30 mm long and 2-4 mm wide, with entire margins or a few shallow lobes toward the tip; the stem leaves are smaller and clasping. Usually two distinct types of basal leaves can be distinguished: larger, broader ones produced in the fall, and narrower ones produced in the spring. The leaves and stem are grayish-white with a dense cover of small, branched hairs. The several to many white or blush-tinged flowers are borne in an unbranched spike-like inflorescence. Flowers are tightly clustered at first, but become further apart in fruit; they have 4 petals, which are 9-13 mm long and 3-5 mm wide, and densely hairy sepals, which are 6-7 mm long and about 2 mm wide. The grayish, hairy fruits are 3-5 cm long and 1-2 mm wide; they are held nearly erect when mature and have two narrow chambers with a single row of small seeds in each one. Flowering occurs from late April-early June.

The relatively small size and densely hairy, erect fruits of *Arabis fecunda* are distinctive. *Arabis hirsuta* and *A. glabra* have erect fruits, but are taller and have larger leaves. *Arabis drummondii*, *A. divaricarpa* and *A. lyallii* also have erect fruits, but these are glabrous rather than densely hairy.

**HABITAT:** Sapphire rockcress is endemic to the northern Rocky Mountains of southwest Montana. It reaches its northern extent in the western foothills of the Sapphire Range in the Willow Creek drainage (Ravalli County) and extends south to the northern foothills and mountains of the East Pioneer Range (Beaverhead County, lower Big Hole River drainage) and the Highland Mountains (Silver Bow County).



Arabis fecunda habitat (EO #17)

The species occurs on moderate to steep slopes with warm (SE, S, SW, W) aspects and relatively sparse vegetation. Most sites are in lower slope positions, although populations do occur on mid and upper slopes. Sites in the Sapphire Mountains are at or below 5000 feet while populations in the southern portion of the range are 5500-8000 feet. Sapphire rockcress occurs on soils derived exclusively from calcareous sediments that have been metamorphosed to some extent by contact with granitic intrusions (Lesica 1993). Soils are generally sandy in texture with low organic matter content and a light albedo. Soil analyses from the Charley's Gulch site in Ravalli County indicate a silty-sand texture and high

calcium content. Parent materials from Ravalli County belong to the Wallace Formation in the Precambrian Belt Series, while those from Beaverhead and Silver Bow Counties are Paleozoic Madison limestone.

In Ravalli County, zonal vegetation is typically *Artemisia tridentata/Festuca idahoensis/Elymus spicatus* steppe, sometimes with a sparse overstory of *Pinus ponderosa*. In Beaverhead and Silver Bow Counties, it grows in *Cercocarpus ledifolius*, *Juniperus scopulorum* or *Pinus flexilis* woodland, very open *Pseudotsuga menziesii* forest, or sparse *Elymus spicatus* grassland.

**ECOLOGY:** Sapphire rockcress occurs in areas of relatively sparse vegetation. At three sites in Ravalli and Beaverhead Counties, coverage of bare soil varied from 40-80%, and basal vegetation from 20-50% (Lesica and Shelly 1994). Many of the sites occur on steep slopes with periodic natural erosion. In some cases these slopes support cryptogamic soil crusts that are beneficial to the survival of older, larger individuals of the species (Lesica and Shelly 1992). Periodic erosion and slumping of steep slope habitat may be partially responsible for maintaining sparse vegetation with reduced competition for light, water and nutrients (Lesica 1993). Many sites would be considered early successional or edaphic disclimaxes, and these conditions may be important for the species' persistence. Fire was relatively frequent in many of these areas, but the sparse vegetation on the slopes occupied by this species probably did not carry fire well.

MANAGEMENT CONSIDERATIONS: Several factors may affect the long-term persistence of this species, including exotic weed encroachment, grazing, herbicide application, mining and pathogens. Spotted knapweed (*Centaurea maculosa*) has severely invaded *Arabis fecunda* habitat in Ravalli County, and studies have shown reduced recruitment of new Sapphire rockcress plants into the population in these areas. Spotted knapweed is an aggressive Eurasian weed present at all sites in Ravalli County. This taprooted perennial is widely introduced in North America where it has become a serious invader of semi-arid grasslands in the Pacific Northwest and intermountain valleys of the northern Rocky Mountains. Its ability to invade and replace native plants is well documented. Most of our *Arabis fecunda* sites have severe infestations of spotted knapweed. It has been shown to have adverse effects on many native species including sapphire rockcress. Research on water-use efficiency in this species has shown significant differences between low-elevation populations in the Bitterroot Valley and those at higher sites in Beaverhead County, suggesting that Bitterroot Valley populations, which are most threatened by weed encroachment, may be genetically distinct.

Roads are a major source of weed infestation, and road construction or other major disturbances that may introduce or provide avenues for the introduction of weeds could negatively impact populations of sapphire rockcress. Livestock can also be a significant vector for exotic weed encroachment. Currently, spotted knapweed does not occur at the Beaverhead or Silver Bow County sites, but it does occur in these counties and may become a problem.

Livestock grazing occurs at most sites, although heavy grazing is reported for fewer than half of the sites. Direct herbivory has never been observed and is probably rare, however, soil crusts are beneficial to the species' survivorship at some sites; such crusts are often destroyed by livestock. Livestock can also adversely affect survivorship by trampling plants. Exclosure studies were conducted at two sites near the Big Hole River. At one site sapphire rockcress increased in the grazing exclosure while it decreased in another. Sapphire rockcress establishes best when not competing with other species, and grazing may limit competition. It is interesting to note that some of the largest populations (Birch Creek and Jerry Creek) are in areas with the most intensive grazing.

Herbicide application is currently the most commonly employed method for controlling spotted knapweed infestations, however, little is known about the specific effects on sapphire rockcress, so herbicide

application should be avoided in direct proximity to sapphire rockcress populations. At this time only one sapphire rockcress site is near an active mine, and it has not been impacted to date. Nonetheless, there are populations near mining claims or inactive mines that could become active with improved extraction methods or increases in the value of minerals [from Lesica 2003].

Astragalus convallarius var. convallarius (Fabaceae)

#### Lesser rushy milkvetch

BLM Status: Sensitive Heritage Ranking: G5/S2

**RANK JUSTIFICATION:** The distribution of *A. convallarius* in Montana is limited to two disjuct localities in the state: the Helena Valley vicinity, and an area in extreme southwest Montana in Beaverhead County. The species is being negatively impacted by development in portions of the Helena area, and past development in the Helena Valley probably eliminated areas of previously occupied habitat resulting in the more fragmented distribution seen today. The grassland habitats this species occupies are also being invaded by several noxious weeds. Several large occurrences are presently known and some areas of potentially suitable habitat remain unsurveyed.

**IDENTIFICATION:** Lesser rushy milkvetch is a slender, herbaceous perennial with 1-6 erect to spreading stems, rising up to 5 dm high from a branching, underground rootcrown. The compound or simple leaves are 2-11 cm long with 0-5 pairs of thread-like leaflets. Leaflets of the upper leaves are usually lacking, giving them a grass-like appearance. Foliage is sparsely hairy to glabrous in the upper portion. Off-white or yellowish, pea-like flowers are sparsely scattered on stalks which are 2-14 cm long and arise from the axils of the upper leaves. The upper petal of each flower is 7-11 mm long and bent upward. The calyx is 4-6 mm long and sparsely covered with white or black hairs.



Astragalus convallarius plant

Pendent, green or purple-mottled fruits are bean-shaped, 13-50 mm long, and 2-4 mm wide. Flowering occurs from June-early July, fruiting in late June-early August.

Only the typical variety of the species is known in the state. *A. ceramicus* looks similar in appearance but can be distinguished by the shorter calyx tube (2-3.5 mm long) and the inflated, oblong-ellipsoid pods,



Astragalus convallarius habitat

whereas the pods of *A. convallarius* are compressed and linear to oblong. *Astragalus convallarius* has sometimes been lumped with the species *A. diversifolius*.

**HABITAT:** Astragalus convallarius occupies grasslands and open ponderosa pine woodlands in the valleys and foothills. Festuca scabrella, Festuca idahoensis, and Elymus spicatus are common bunchgrass associates.

Brickellia oblongifolia var. oblongifolia (Asteraceae)

Mohave brickellbush

BLM Status: None Heritage Ranking: G5/S1

**RANK JUSTIFICATION:** Only three extant occurrences are known in the state, all occurring near Melrose. The current status of one historical occurrence near Wilsall is unknown.

**IDENTIFICATION:** Glandular-puberulent herb or subshrub, 1-6 dm tall, generally with many stems from near the base. Leaves all cauline, mostly sessile, alternate or occasionally opposite to subopposite, entire or nearly so, lance-linear to oblong or elliptic, 1-4 cm long and up to 15 mm wide. Leaves mostly 2-8 times as long as wide. Heads terminating the branches or subcorymbosely clustered and relatively large. The involucres 10-20 mm high with acute to acuminate bracts. Flowers ochroleucous, numerous with about 40-50 flowers in each head. Achenes 4.5-6 mm long.

*Brickellia oblongifolia* is similar to *Brickellia grandiflora*, which differs in having broad, toothed leaves. *B. eupatorioides* closely resembles *B. oblongifolia*, but has toothed leaves and feathery (plumose) pappus bristles on the top of the fruit. *B. oblongifolia* var. *oblongifolia* is the only variety of the species in Montana.

**HABITAT:** Typical habitats include rock outcrops, talus, and scree; and dry, sparsely-vegetated, southerly slopes.

Additional information on management considerations for the species, as well as information on the species' ecology in Montana is not available at this time.

Carex idahoa (Cyperaceae) (syn: Carex parryana ssp. idahoa)

#### Idaho sedge

BLM Status: Sensitive Heritage ranking: G2/S2

**RANK JUSTIFICATION:** *Carex idahoa* is a regional endemic known from just over 30 sites in Montana, most on public lands. The estimated number of stems reaches tens of thousands, but total occupied habitat is estimated at less than 200 acres. The species is palatable and populations may be affected by heavy grazing. Other risks are competition from exotic species, hydrologic alterations, agricultural development, and road construction/maintenance.

**IDENTIFICATION:** Idaho sedge forms small clumps that arise from rhizomes. The stems are 20-35 cm high with most leaves crowded near the base. Leaves are flat and 2-4 mm wide. Flowers are clustered in 1-4 oblong-cylindrical spikes, each 1-3 cm long, with the uppermost being larger than the others. Male flowers are absent or scattered among the perigynia on the largest spike. The spikes form a narrow, interrupted head, subtended by small leaf-like bracts, at the top of the stems. The narrowly oval scales subtending each perigynia taper to the tip and are 2-3 times longer than the perigynia. These scales are brown with membranous margins and a distinct pale center. The glabrous, egg-shaped perigynia are yellow-green and about 3 mm long with a short beak. There are 3 stigmas and the seed is 3-sided. Fruits mature in July-August. The uppermost spikes of Carex parryana ssp. parryana are cylindrical and more-or-less equal



Carex idahoa

in size, while in *Carex idahoa* and *Carex parryana* ssp. *hallii*, the terminal spike is enlarged and clubshaped. Female scales of *C. p.* ssp. *hallii* are as long as the perigynia, while they are much shorter than the perigynia in *C. idahoa*.



Carex idahoa habitat

HABITAT: Carex idahoa occurs in moist, alkaline meadows, often along streams (Vanderhorst and Lesica 1994). It most often occupies ecotonal areas between wet meadow and sagebrush steppe (Lesica 1998), and appears to be restricted to nearly level sites in the high valleys of southwest Montana. It is commonly found on terraces of headwater streams above 6000 feet elevation. Small populations may occur at lower elevations or along larger streams. Soils tend to be silty, with ample organic matter with little or no coarse material (Lesica 1998). Most documented Montana populations are in areas with calcareous parent material, however a few occupy non-calcareous sites.

Its moist, alkaline, streamside meadow habitat is typically dominated by graminoids (especially *Deschampsia caespitosa, Juncus balticus, Carex praegracilis, Carex nebrascensis, C. aquatilis*), with or without *Potentilla fruticosa* (Vanderhorst and Lesica 1994; Lesica 1998). Adjacent steppe vegetation is dominated by *Artemisia tridentata* and/or *A. tripartita, Festuca idahoensis*, and *Agropyron smithii*. Species most commonly associated with Idaho sedge are, in order of importance, *Juncus balticus, C. praegracilis, Muhlenbergia richardsonis, Aster occidentalis, Poa pratensis, Taraxacum officinale, <i>Potentilla gracilis*, and *Antennaria microphylla*. Graminoid cover is high (60-100%), and forb cover low to moderate (5-50%) except in overgrazed areas. Bare ground averages 8% and cover of lichens and

bryophytes averages 14% (Lesica 1998). Idaho sedge consistently occurs in subirrigated soils associated with low-gradient streams or springs and seeps. These soils are wet early in the growing season but are only moist later in the summer. In wetlands where part of the habitat is saline (as indicated by the presence of *Distichlis* and *Puccinellia*), it is usually limited to non-saline areas, although it has been found in salt-encrusted soils (Lesica 1998).

**ECOLOGY:** Flooding is probably uncommon in most of these habitats, as they tend to occur in headwater areas where snow accumulation and stream gradients are low (Lesica 1998). Although fire was common in high-elevation steppe vegetation in southwest Montana prior to European settlement, it probably did not play an important role in the dynamics of herbaceous riparian wetlands (Lesica 1998).

MANAGEMENT CONSIDERATIONS: Carex idahoa can probably tolerate light to moderate livestock grazing but will decline under heavy grazing (Lesica 1998). Its wetland habitat is favored by cattle and frequently subject to overgrazing on both public and private lands. Graminoids such as sedges are adapted to grazing and are usually able to persist with light to moderate grazing pressure (Lesica 1998). Evidence suggests that this species responds to grazing similarly to many palatable graminoids, and is capable of tolerating light to moderate grazing, but would likely decline under continuous heavy grazing. This is based on correlation data and studies of other, anatomically similar species. Experiments and monitoring studies to determine the actual response of Idaho sedge have not been conducted (Lesica 1998); however grazing regimes that permit 50% or less annual utilization and allow seed production and dispersal at regular intervals will likely be compatible with its survival.

Almost all known populations of the species on public land are subject to livestock grazing, as is much of its habitat on private land (Lesica 1998). Its mesic habitat provides high quality, green forage for livestock throughout the summer and is a magnet for cattle, often leading to overgrazing. Many of the small populations occur in localized springs, seeps, or along small streams in extensive semi-arid steppe, and are particularly at-risk from overgrazing, which can cause streambank destabilization followed by lowering of the water table and a loss of riparian vegetation (Lesica 1998). Populations in larger wetland areas may not face such intensive grazing pressure.

Large areas of potential habitat for this species in southern Beaverhead County are mowed for hay. While the effects of mowing on native vegetation are unknown, plowing and seeding of non-native species almost certainly have adverse effects on native communities and may result in local extirpation of native species. *Poa pratensis* (Kentucky bluegrass) is the only exotic plant documented with significant frequency in this species' habitat (Lesica 1998). It is a rhizomatous grass similar in stature to the Idaho sedge, and may compete with it, especially where there is grazing and trampling by livestock. *Taraxacum officinale* (dandelion) and *Trifolium repens* (clover) occur at some sites, but these are short plants that increase only where heavy grazing removes the larger graminoids, and by themselves do not pose a threat to Idaho sedge.

Roads are often constructed along or adjacent to riparian areas, and have impacted wetland habitat for three Idaho sedge populations (Lesica 1998). A fourth is vulnerable to road improvement and construction. Road development can reduce or degrade habitat through increased runoff, pollution, and physical disturbance. Use of these roads for ranching and recreation probably has little impact on the species; however maintenance or widening can lead to habitat loss. A portion of Moose Creek, where one population occurs, has been dredged, presumably for mineral extraction (Lesica 1998). Dredging most likely reduces the extent and character of riparian vegetation, and may reduce habitat for Idaho sedge. Fortunately, most populations do not occur in areas prone to mining activity [from Lesica 2003].

Delphinium bicolor ssp. calcicola (Ranunculaceae) Limestone larkspur

BLM Status: None

Heritage ranking: G4G5T3/S3

RANK JUSTIFICATION: Endemic to Montana.

**IDENTIFICATION:** Limestone larkspur is a perennial 10-30 cm tall arising from deep roots branched at least 1 cm below the stem attachment. Leaves are on the lower 1/3 of the stem, with 2-7 basal leaves at the time of flowering. Leaf blades are 1.5-7 cm long, round in

outline, with few-many lobes, and glabrous to puberulent. Sepals are bright, dark blue,



Delphinium bicolor ssp. calcicola flowers

16-21 mm long, and there is a cleft in the lower petals at least 2 mm deep. Flowering occurs in late spring to early summer although usually somewhat later than the typical subspecies where the two overlap.

Distinguished from the widespread *Delphinium bicolor* ssp. *bicolor* by the bright blue sepals, the deep cleft in lower petal blades 2 mm or greater, and upper petals with solid white-lavender tips rather than with distinct purple veins. Most collections of this taxon prior to 1995 have typically been identified as *D. andersonii* or *D. geyeri*.

**HABITAT:** Common habitats include shortgrass prairie and grass-sagebrush communities on limestone-derived soils, usually with coarse fragments at the surface, or on limestone outcrops. Elevations typically range from 4,200-6,800 feet.



 $Delphinium\ bicolor\ ssp.\ calcicola$ 

Additional information on management considerations for the species, as well as information on the species' ecology in Montana is not available at this time.

Erigeron linearis (Asteraceae)

#### Linear-leaf fleabane

BLM Status: Sensitive Heritage ranking: G5/S1

**RANK JUSTIFICATION:** *Erigeron linearis* is a peripheral species known from a few small, localized occurrences. Mining, grazing and the encroachment of exotic weeds are factors that may affect long-term population stability.

**IDENTIFICATION:** Linear-leaf fleabane has unbranched stems that are 5-30 cm tall and which arise from a stout taproot and branched rootcrown. The mostly basal leaves are linear and 1-9 cm long. The bases of the stems and leaves are enlarged and



Erigeron linearis

straw-colored or purplish, and the herbage is covered with fine, gray hairs. The flower heads are usually solitary at the ends of the stems. The involucral bracts are 4-7 mm long and are covered with long, appressed hairs and occasionally also with glands. The 15-45 yellow rays are 4-11 mm long and the yellow disk flowers are 3-5 mm long. There are 10-20 pappus bristles at the top of each achene. Flowering occurs from May to early June.

Linear-leaf fleabane is our only *Erigeron* with yellow ray flowers. *Erigeron filifolius* also has narrowly linear leaves but the ray flowers are white or blue and there is more than one head per stem. Members of the genus *Stenotus* (formerly *Haplopappus*) have yellow rays, but the involucral bracts are in 2-3 series of different height.



Erigeron linearis habitat

HABITAT: Erigeron linearis occurs in dry, often rocky soil from the foothills up to moderate elevations, frequently with sagebrush (Heidel and Cooper 1998). Dominant species in its habitat include bluebunch wheatgrass (Elymus spicatus) and mountain big sagebrush (Artemisia tridentata ssp. vaseyana). Associated species and habitats vary widely. In the Scratchgravel Hills near Helena, it occupies two distinct habitats - one a midslope opening on a steep east-facing timbered hillside, and the other a gently southwest-facing lower slope in open rolling plains. In Beaverhead County, linear-leaf fleabane was found on granular, diabase-derived soil in rolling sagebrush steppe, where it occupied a disturbed opening dominated by Agropyron

smithii, along with other species characteristic of disturbed areas, including Arenaria kingii, Bromus tectorum, Chrysopsis villosa, Haplopappus acaulis, Oxytropis sericea and Phlox bryoides. Other small populations in Beaverhead and Silver Bow Counties were found in sparse vegetation.

**ECOLOGY:** Linear-leaf fleabane is an herbaceous perennial. At one locality in Beaverhead County, Heidel and Vanderhorst (1996) speculated that the site may have been grubbed or burned, resulting in removal of the sagebrush cover. The low stature of this plant probably means that it responds positively to the disturbance of livestock grazing.

**MANAGEMENT CONSIDERATIONS:** Leafy spurge and spotted knapweed threaten populations in the Scratchgravel Hills. Observations suggest that this species may respond positively to disturbance. Some populations might have been established through human activity, because the species is highly localized within what appears to be extensive suitable habitat, in locations of historically intense mining activity [adapted from Heidel and Cooper 1998].

Lesquerella klausii (Brassicaceae)

## Divide bladderpod

BLM Status: None Heritage ranking: G3/S3

**RANK JUSTIFICATION:** Lesquerella klausii is a state endemic restricted to central-Montana with the majority of populations occurring in the Big Belt Mountains and extending north to the southern end of the Rocky Mountain Front. Total population numbers are fairly large and the species typically occurs on gravelly slopes that are not usually subject to human disturbance.

**IDENTIFICATION:** Divide bladderpod is a short-lived perennial forb with a rosette of basal leaves from a taproot and unbranched rootcrown. Flowering stems are 6-15 cm long, erect or lie flattened on the ground and then curving upwards at the tip. Leaves are typically broadly spoon-shaped and 6-9 mm long. Herbage is densely covered with branched, stellate hairs. Flowers are borne on curved or S-shaped pedicels in a loose inflorescence that is 10-30 mm long. The yellow petals are 6-8 mm long. The broadly heart-shaped fruits are about 5 mm wide, 4 mm tall, compressed perpendicular to the suture, and densely hairy. Flowering occurs in May and early June, fruiting in late May through June.



Lesquerella klausii flowers & fruit

*Physaria geyeri* closely resembles *Lesquerella klausii* and a technical manual should be consulted to distinguish between the two. The two species are usually separable by the mostly disjuct ranges of the two; with *P. geyeri* occurring mainly in the southwest part of the state.



Lesquerella klausii plant

**HABITAT:** The species occurs on open shale slopes and gravelly areas, at moderate to fairly high elevations in the mountains.

**ECOLOGY:** Most species of *Lesquerella* are crosspollinated by insects. Seed dispersal is probably most prevalent near the parent plant, though longer dispersal by wind and gravity are possible. High recruitment levels the two years following a wildfire have been noted. Reproduction by seed is the only means of recruitment. Individual populations vary in size from a few plants to several thousand plants. *L. klausii* appears tolerant of light to moderate disturbance based on the unstable habitats it frequently occupies.

#### Penstemon lemhiensis (Scrophulariaceae)

## Lemhi beardtongue



Penstemon lemhiensis

BLM Status: Sensitive Heritage ranking: G3/S2

RANK JUSTIFICATION: Penstemon lemhiensis is a regional endemic that occurs only in southwest Montana and adjacent Idaho. There are over 50 known populations in Montana, but most have fewer than 100 individuals. Estimates in 1999 placed the total number of individual plants in Montana at about 3000. Its habitat is threatened by the encroachment of spotted knapweed, especially in Ravalli County, and by reduction in wildfire frequency. Mining has also impacted it historically.

**IDENTIFICATION:** Lemhi beardtongue is a large perennial, with 1 to several stems up to 70 cm tall arising from a branched rootstock and a short taproot. The leaves are narrowly lance-shaped and entire-margined. The basal leaves have a petiole and are up to 16 cm long. The opposite stem leaves lack petioles and are reduced upwards. Herbage is lightly covered with small hairs and occasionally has a thin, bluish wax. The inflorescence

consists of clusters of several short-stalked flowers in the axils of the upper leaves. The tubular corolla is flared and two-lipped at the mouth, 25-35 mm long, and bright blue. The lance-shaped calyx segments taper to a long tip, are 7-11 mm long, and have a narrow, white margin. The anthers are hairy with short pubescence, and the staminode is glabrous. Flowering generally occurs from early June-late July, depending on climatic conditions and elevation. Fruits mature and dehisce during August-early September.

Lemhi beardtongue is a perennial herb, 3-7 dm tall, with one to several stout stems from a branched caudex; herbage often finely hirtellous-puberulent at least in part; leaves entire, the basal ones clustered, up to 15-20 cm long and 1-2.5 cm wide, with petiolate, oblanceolate to narrowly elliptic blades; cauline leaves sessile, opposite, mostly lanceolate, up to 10-12 cm long and 1-2 cm wide; inflorescence glabrous, of several to many loose verticillasters, more or less secund in life; calyx 7-11 mm long, the segments lanceolate to narrowly ovate, evidently but not strongly scarious-margined below, tapering to a long-

acuminate or subcaudate tip; corolla bright blue to purplish, 25-35 mm long, about 1.0 cm wide at the mouth; pollen sacs 1-3 mm long, divaricate, evidently dentate-ciliate along the sutures, pubescent near the connective and on the side away from dehiscence; staminode glabrous; capsules about 10-15 mm long; seeds about 2-3 mm long (Shelly 1987).

*Penstemon cyaneus* is very similar but has sepals that are rounded at the tip and nearly as broad as long. *Penstemon cyananthus* has smaller flowers only 15-25 mm long.

**HABITAT:** In Montana, *Penstemon lemhiensis* occurs on moderate to steep, east- to southwest-facing slopes, often on open soils. In Beaverhead County, it typically grows below or near the lower extent of Douglas-fir and/or lodgepole pine forests. Associated vegetation is typically dominated by big sagebrush and bunchgrasses, including western wheatgrass and Idaho fescue. Within these habitats, Lemhi



Penstemon lemhiensis habitat

beardtongue prefers areas that are more sparsely vegetated (Shelly 1990). In the northeastern Pioneer Mountains, it inhabits forb-dominated openings in lodgepole pine, and to a lesser extent Douglas-fir, forests; big sage is typically not present, and prominent forbs include *Astragalus miser*, *Pedicularis contorta* and *Townsendia parryi*.

The species is not restricted to any particular geological substrate; it has been found on granitic soils, as well as limestone and other sedimentary substrates. Soils are often very gravelly, however soil texture is highly variable and ranges from sand to fine clay. Field surveys from 1986-1989 indicate that it is most commonly found on gravelly loams. At some sites the populations can occur partially or entirely on roadbanks.

**ECOLOGY:** Lemhi beardtongue has some degree of adaptation to natural disturbance, as evidenced by its preference for more open habitats, such as rock outcrops and steep, rocky slopes with natural soil slippage (Shelly 1990). This adaptation is even clearer where plants have colonized roadbanks.

Studies have shown that seed germination and recruitment are the most critical life history stages (Heidel and Shelly 2001). In general, both flowering and germination are higher in cool, wet springs and early summers, and are correlated with April-June mean maximum monthly temperature and net precipitation in the same period. Mortality of established plants is highest in hot, dry years (Heidel and Shelly 2001).

**MANAGEMENT CONSIDERATIONS:** Monitoring studies on National Forest and BLM lands in southwest Montana have documented sharp declines in some of the largest populations east of the Continental Divide (Shelly 1990; Achuff 1992). One relatively small monitored population was restricted to roadcut habitat and was similarly in decline. Continued declines were projected in the absence of seed germination and recruitment at part or all of the other three sites. Waxing and waning of populations is expected for native ruderal species such as *Penstemon lemhiensis*.

Fire suppression has been suggested as a factor in the rangewide decline of Lemhi beardtongue (Moseley et al. 1990). The species is thought to increase in abundance under certain fire regimes, based on qualitative observations after a wildfire in Salmon National Forest and monitoring of a prescribed burn in Big Hole National Monument, where it increased a decade after the burn but disappeared from an adjoining untreated area (Heidel and Shelly 1997). Another monitoring study at Badger Pass found that recruitment increased dramatically after fire treatment, consistent with the tendency of fire-adapted species to show recruitment from seedbanks when fire removes accumulated litter and reduces competition. Based on these studies, prescribed burning has been recommended where Lemhi beardtongue occupies deep-soil rangeland habitats east of the Continental Divide, which are prone to an increasing density of *Artemisia tridentata* in the absence of fire (Heidel and Shelly 2001).

Spotted knapweed is a widespread invader in this species' habitat, particularly west of the Continental Divide. Where Lemhi beardtongue occurs in the Bitterroot National Forest, management of the species with fire is problematic because of the high potential for noxious weeds to expand after fire (Heidel and Shelly 2001). Although herbicides can be used to control invasive species, their effect on the pollinators of Lemhi beardtongue is not known. It is an obligate out-crosser, primarily dependent on insect pollination, and relatively small, isolated populations may already be at a disadvantage in their ability to attract effective pollinators (Shelly 1990). Spotted knapweed has not yet invaded populations in Beaverhead and Silver Bow Counties, though it has been observed in nearby areas where it can still be controlled without direct impact to the species.

Grazing exists throughout much of the species' range in southwestern Montana, and monitoring transects have been established to assess its effect on populations. The habitat of Lemhi beardtongue was

historically impacted by mining at some locations, and renewed gold mining activity could pose a future threat (Shelly 1990) [from Lesica 2003].	e

Physaria saximontana var. dentata (Brassicaceae)

## **Rocky Mountain bladderpod**

BLM Status: None

Heritage ranking: G3T3/S3

**RANK JUSTIFICATION:** Rocky mountain bladderpod is a state endemic known from several counties scattered across central and western Montana.

**IDENTIFICATION:** The species is perennial with a taproot and usually simple caudex; silvery pubescent throughout with stellate trichomes with forked rays. Stems few to numerous, prostrate to decumbent, and 3-10 cm long. Basal leaves rosulate, densely pubescent with appressed trichomes, petiolate, 1.5-3 cm long, 8-14 mm wide, petiole winged, blade orbicular to broadly obovate, obtuse with broad, obscure, tooth-like angles on each side at the apex. Cauline leaves broadly spatulate to linear-oblanceolate, entire, 1-1.5 cm long. Sepals narrowly oblong, 5-6 mm long. Petals yellow, spatulate, 8-10 mm long, 2-3 mm wide. Inflorescence condensed to slightly elongated. Fruiting pedicels divaricately ascending, straight to slightly curved, 6-10 mm long; siliques deeply lobed, inflated at maturity, sinus absent below, deep above, valves irregular, rounded, densely pubescent with spreading trichomes, 3-4 mm long, 1.5-2 mm wide. Styles 3-5 mm long; ovules 2-4 in each locule. Flowering and fruiting occur in June and July with fruits maturing into August.

The typical variety *P. saximontana* var. *saximontana*, which is currently known only from Wyoming, can be distinguished by its entire basal/rosette leaves and longer styles (3 or more times the length of the replum) vs. the toothed apical margins of the basal/rosette leaves of variety *dentata* and the shorter styles (1-2 times or less the length of the replum). The species is also very similar to *P. didymocarpa*, but can be separated by the lack of a basal sinus on the silique of *P. saximontana*.

**HABITAT:** Rocky mountain bladderpod is typically found in limestone-derived talus, fellfields, and gravelly slopes at moderate to high elevations.

Additional information on management considerations for the species, as well as information on the species' ecology in Montana is not available at this time.

Townsendia spathulata (Asteraceae)

#### Sword townsendia

BLM Status: None Heritage ranking: G3/S3

**RANK JUSTIFICATION:** Sword townsendia has a limited distribution in limestone areas of southwest and south-central Montana.

**IDENTIFICATION:** Sword townsendia is a perennial 1-5 cm tall with a stemless crown surmounting a taproot. Leaves are spathulate, 1-1.5 cm long and 2-4 cm wide, covered by dense, long hairs that give them a woolly



Townsendia spathulata

appearance, and tightly clustered in a rosette. The 1-many flower heads are sessile, or solitary on leafless stalks. Ray flowers are 1-2 cm long, with a pale, off-white color. Flowering occurs in early May to late June. Plants flower and disperse fruit over a two-four week period.

Townsendia spathulata is distinguished from other Townsendia species in our area by its pale, off-white rays and spathulate leaves. This name has been misapplied in the past to include *T. condensata*, which is a high elevation regional endemic only known in Montana from Glacier National Park and the Absoroka – Beartooth region.

**HABITAT:** Sword townsendia is found on open, rocky, limestone-derived soils of slopes and windswept ridgetops in the valley and foothill zones, in mountain mahogany woodlands and cushion plant grasslands.

Additional information on management considerations for the species, as well as information on the species' ecology in Montana is not available at this time.

# APPENDIX D. BUTTE FIELD OFFICE ELEMENT OCCURRENCE MAPS

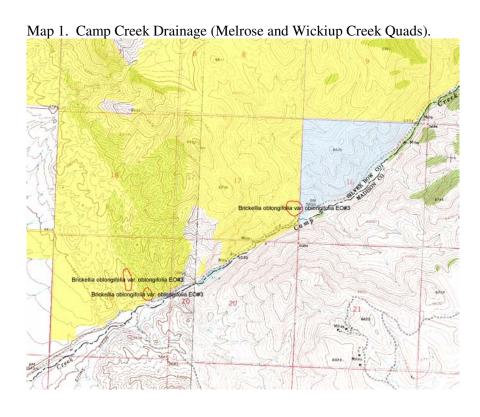
## BUTTE FIELD OFFICE ELEMENT OCCURRENCE MAPS

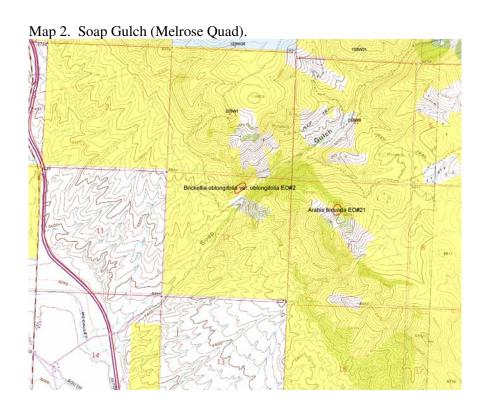
Documented occurrences of Montana Natural Heritage Program Species of Concern known at the time of this report are displayed in the following maps. General map areas with known occurrences are referenced below by map number and page number. Additionally, Element Occurrences are listed alphabetically and referenced to map number. Mapped areas represent actual observed boundaries whenever possible. However, many occurrences are based on surveys or specimen collections that do not provide specific mapped boundaries. In these cases, boundaries are mapped according to TRS data, directions and/or provided coordinates, and the mapped boundaries do not represent the actual population boundaries but the area within which the occurrence is contained.

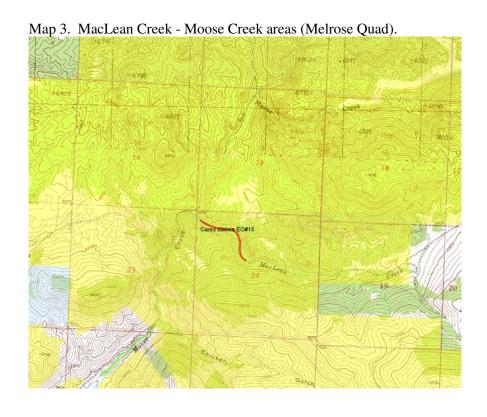
## LIST OF MAPS

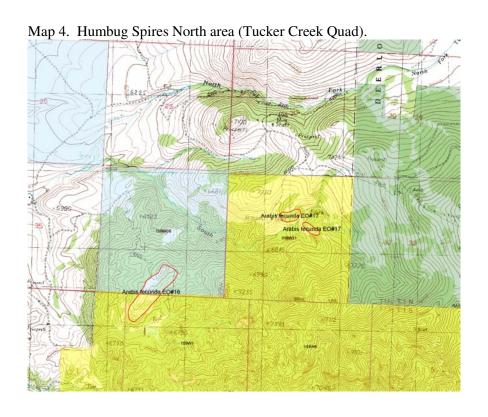
Map 1.	Camp Creek Drainage
	Brickellia oblongifolia EO #3
Map 2.	Soap Gulch
	Arabis fecunda EO #21; Brickellia oblongifolia EO #2
Map 3.	MacLean Creek – Moose Creek areas
	Carex idahoa EO #15
Map 4.	Humbug Spires North
	Arabis fecunda EO #16, 17
Map 5.	Upper Moose Creek
	Arabis fecunda EO #18; Carex idahoa EO #22
Map 6.	Maiden Rock – Goat Mountain area
	Brickellia oblongifolia EO #1; Physaria saximontana var. dentata EO #1; Townsendia
	spathulata EO #10
Map 7.	Wise River area
	Arabis fecunda EO #7, 10, 22
Map 8.	Deep Creek – Bear Creek area
	Penstemon lemhiensis EO #57
Map 9.	Chalk Bluff area
	Penstemon lemhiensis EO #49
Map 10.	Doherty Mountain area
	Delphinium bicolor ssp. calcicola EO #5
Map 11.	Cabin Gulch area
	Delphinium bicolor ssp. calcicola EO #2
Map 12.	Elkhorn Creek area
	Delphinium bicolor ssp. calcicola EO #1
Map 13.	Johnny Gulch area
	Delphinium bicolor ssp. calcicola EO #3
Map 14.	Lone Mountain area
	Delphinium bicolor ssp. calcicola EO #4
Map 15.	Limestone Hills
	Townsendia spathulata EO #6
Map 16.	Kimber Gulch – Beaver Creek area
	Astragalus convallarius EO #4
Map 17.	Crittenden Gulch area
	Astragalus convallarius EO #8
Map 18.	Montana City area
	Astragalus convallarius EO #14

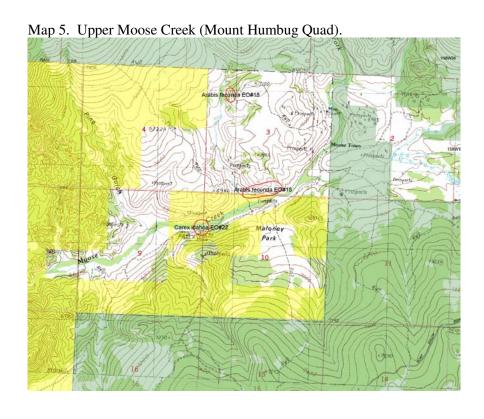
Map 19.	Hauser Dam area	D - 12			
	Astragalus convallarius EO #16				
Map 20.	Copper Butte area	D - 12			
	Astragalus convallarius EO #15				
Map 21.	Towhead Gulch area	D - 13			
	Lesquerella klausii EO #23				
Map 22.	Scratchgravel Hills	D - 13			
	Astragalus convallarius EO #9; Erigeron linearis EO #4, 9; Lesquerella klausii EO #35				
Map 23.	Tenmile Creek area	D - 14			
	Astragalus convallarius EO #13				
Map 24.	Johnson Creek area	D - 14			
	Erigeron linearis EO #6				
ELEME	NT OCCURRENCES BY MAP NUMBER				
Arabis fee	unda EO #7	Man 7			
	unda EO #10				
	unda EO #16	•			
	unda EO #17	_			
	unda EO #18	•			
	unda EO #21	_			
	unda EO #22	_			
-	s convallarius EO #4	_			
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_	s convallarius EO #9	•			
_	s convallarius EO #13	•			
_	s convallarius EO #14	•			
_	s convallarius EO #15	_			
	s convallarius EO #16				
_	oblongifolia EO #1	_			
	Brickellia oblongifolia EO #2				
Brickellia oblongifolia EO #3					
Carex idahoa EO #15					
	hoa EO #22	_			
	m bicolor ssp. calcicola EO #1	•			
	m bicolor ssp. calcicola EO #2				
Delphiniu	m bicolor ssp. calcicola EO #3	Map 13			
Delphiniu	m bicolor ssp. calcicola EO #4	Map 14			
Delphiniu	m bicolor ssp. calcicola EO #5	Map 10			
Erigeron	linearis EO #4	Map 22			
Erigeron	linearis EO #6	Map 24			
Erigeron	linearis EO #9	Map 22			
Lesquerel	la klausii EO #23	Map 21			
Lesquerel	la klausii EO #35	Map 22			
	n lemhiensis EO #49	•			
Penstemo	n lemhiensis EO #57	Map 8			
Physaria .	saximontana var. dentata EO #1	Map 6			
Townsendia spathulata EO #6					
Townsena	Townsendia spathulata EO #10				

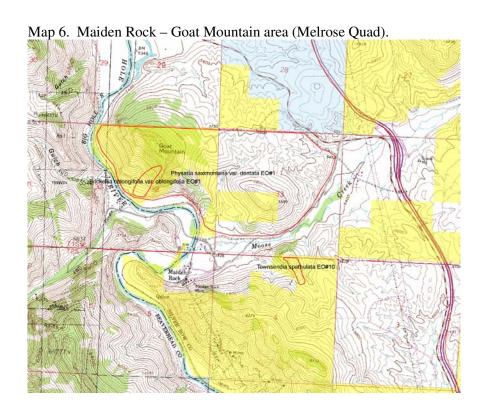


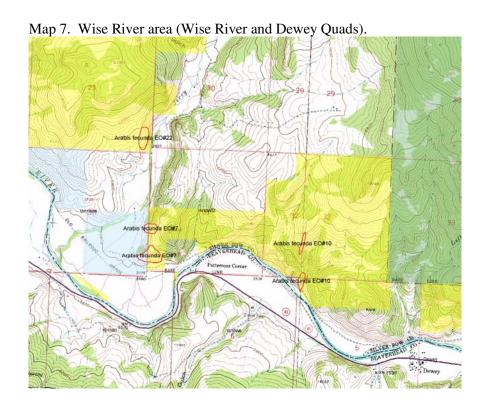


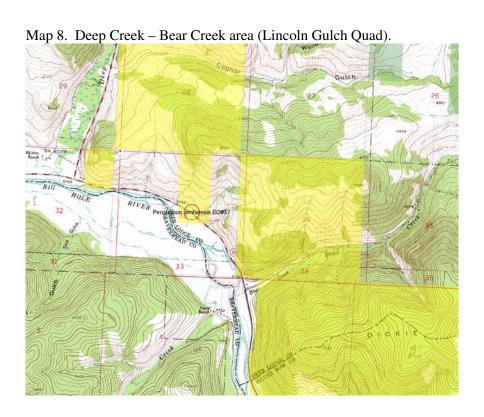


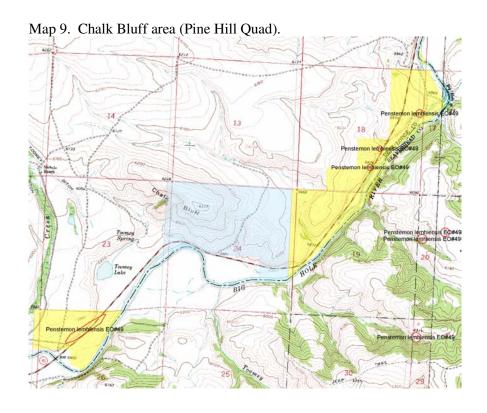


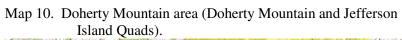


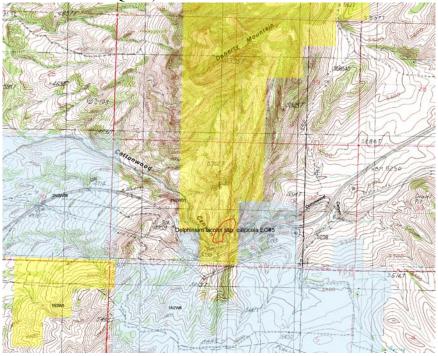


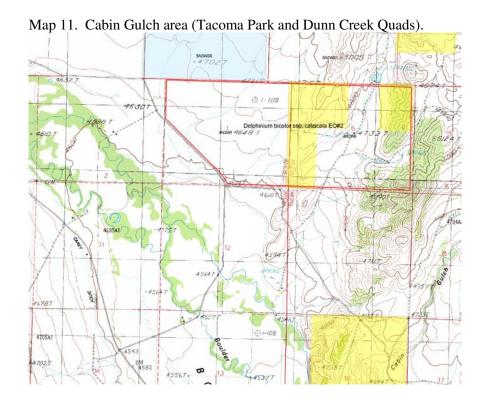


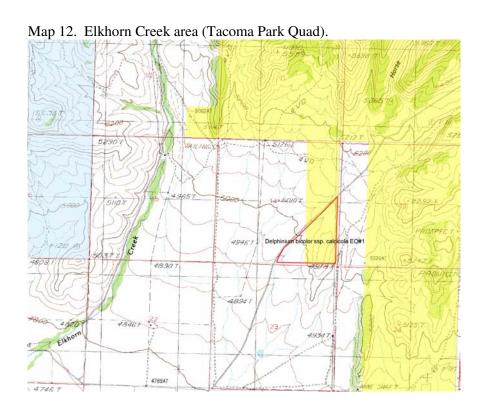


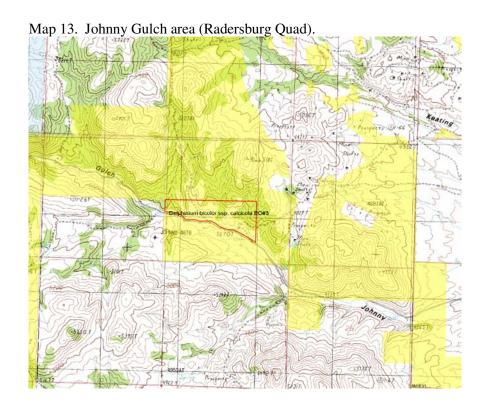


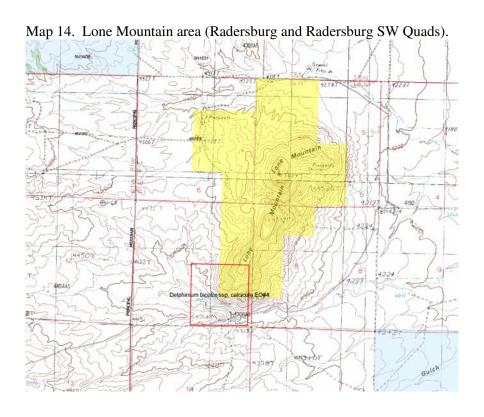












Map 15. Limestone Hills (Townsend, Giant Hill, Parker and Radersburg Quads).

